Patent Claims

1. Filter device for purification and/or for at least partial dealkization of raw water, with a raw water inlet and a pure water outlet, with a filter line A, comprised of one flow channel segment and a first filtration segment, and with a dilution line B, comprised of an adjustable dilution valve and a second filtration segment, which are connected by means of a distributor device with raw water inlet and a connection device with a pure water outlet, whereby both filtration segments are arranged in an inner container, **characterized in that**

the flow characteristics of the constituents of the dilution line B, defined by the pressure loss function $\Delta p_B(V_B)$, is adapted, according to the flow characteristic of the components of the filter line A, defined by the pressure loss function $\Delta p_A(V_A)$, in such a manner, that for at least one dilution portion X with $X = V_B/(V_A + V_B)$, for volume flows between V_1 = 10 to 120 l/h (first volume flow range), for at least a second volume flow range with range width of at least 5 l/h within the first volume flow range, the dilution condition:

$$\frac{\left|\dot{V}_B \frac{1-X}{X} - \dot{V}_A\right|}{\dot{V}_A} \leq 0.15 = G$$

is satisfied, whereby G represents the threshold value of the dilution condition, $\Delta p_A(V_A)$ the pressure loss in the filter line A and $\Delta p_B(V_B)$ the pressure loss in the dilution line B, in dependence of the volume flows V_A, V_B in [l/min] of water in the lines A and B.

2. Filter device according to claim 1, **characterized in that** the dilution valve (20a) and the second filtration segment (20b) are designed in such a fashion that in the second volume flow range: $\Delta p_{B1}(V_B) < \Delta p_{B2}(V_B)$ is fulfilled, whereby $\Delta p_{B1}(V_B)$ is the pressure loss function of the dilution valve (20a) and $\Delta p_{B2}(V_B)$ is the pressure loss function of the second filtration segment (20b).

3. Filter device according to claim 1 or 2, **characterized in that**, in fully open state, the dilution valve (20a) has a flow characteristic $\Delta p_{B1}(V_B)$, which is adapted to the flow characteristic $\Delta p_{A1}(V_A)$ of the flow channel segment (10a), and

that the pressure loss functions $\Delta p_{A2}(V_A)$ and $\Delta p_{B2}(V_B)$ of the first and the second filtration segments (10b, 20b) are mutually adjusted, whereby the adjustment depends on the desired dilution.

4. Filter device according to claim 3, **characterized in that** the flow surface Q_A and Q_B, expressed in m^2, and the distances h_a and h_b, expressed in m, of the first and the second filtration segments (10b, 20b), are adjusted in such a way that, for the pressure loss function D_A and D_B, expressed in $kPah/m^3$, of the two filtration segments (10b, 20b), following relationship is satisfied:

$$D_A = \frac{X}{1-X} D_B$$

whereby

$$D_A = \int_0^{h_A} \frac{S_A(h)}{Q_A(h)} dh$$

$$D_B = \int_0^{h_B} \frac{S_B(h)}{Q_B(h)} dh$$

and S_A (h) and S_B(h), expressed in kPah/m^2, are the pressure loss coefficients of the filter materials.

5. Filter device according to claim 4, **characterized in that**, Q_A lies in the range of 5 cm^2 to 600 cm^2 and Q_B lies in the range of 1 cm^2 to 300 m^2.

6. Filter device according to one of the claims 1 to 5, **characterized in that** the filter material of the filter line A and/or B is filter grist with average corn size in the range of 0.1 to 2 mm.

7. Filter device according to one of the claim 1 to 5, **characterized in that** the filter material of the filter line A and/or B is a filter block with average pore size in the range of 0.1 to 100 µm.

8. Filter device according to one of the claims 1 to 7, **characterized in that** the outflow from the outlet of the second filtration segment (20b) flows into first filtration segment (10b).

9. Filter device according to claim 8, characterized in that the outflow from the outlet of the second filter segment (20b) flows into the second half of the first filtration segment (10b).

10. Inner container for a filter device according to one of the claims 1 to 9, **characterized in that** it has a first filter chamber (54), in which a second filter chamber (55) is arranged, whereby each filter chamber (54, 55) is connected with a partial flow flowing in from above, and below both the filter chambers (54, 55) a common collection chamber (57) with pure water outlet (5) is arranged for collection of filtered partial flows.

11. Inner container according to claim 10, **characterized in that** at least one or both of the filter chambers (54, 55) are subdivided into at least two chamber segments (54a, 54b), in which different filter materials are arranged.

12. Inner container according to claim 10 or 11, **characterized in that** in the collection chamber (57) and/or in the pure water outer (5) filter materials are arranged.

13. Inner container according to one of the claims 10 to 12, **characterized in that** both the filter chambers (54, 55) extend up to the main drainage pipe (57), whereby the first filter chamber (54) surrounds the second filter chamber (55) in annular form.

14. Inner container according to one of the claims 10 to 13, **characterized in that** on the bottom wall (52) of the inner container (50), an annular drainage plate (71) with filter orifices (72) is mounted, which has radial collection channels (73) on the side facing the bottom wall (52), and a copular insert (70), extending upwards from the drainage plate (71).

15. Inner container according to claim 14, **characterized in that** a double-walled pipe (60) is mounted in the lid (50).

16. Inner container according to claim 15, **characterized in that** the outer pipe (61a) of the double-walled pipe (60) projects into the first filter chamber (54).

17. Inner container according to claim 16, **characterized in that** the outer pipe (61a) has a distributor device (63) in the area of the first filter chamber (54), for distribution of the inflowing water.

18. Inner container according to claim 17, **characterized in that** the distributor device (63) has nozzles (62) encircling the perimeter of the outer pipe (61a).

19. Inner container according to one of the claims 10 to 18, **characterized in that** the first filter chamber (54) is filled at least with ion exchanger resin.

20. Inner container according to one of the claims 10 to 19, **characterized in that** the second filter chamber (55) is filled at least with activated carbon.

Key	Text in German	Translation
1	Druckverlust Strang A	Pressure Loss Branch A
2	Schüttung	Grist
	Drossel	Throttle
	Summe	Total
3	Druckverlust Strang B	Pressure Loss Branch B
4	Bei 50% Grundauslegung	With 50% Basic Layout
5	Summe A	Total A
	Summe B	Total B
	Summe B Ideal	Total B Ideal
6	Verschnitt bei 50% Grundauslegung	Dilution for 50% Basic Layout
7	Real Grund 50%	Real Basic 50%
	Ideal 50%	Ideal 50%
	Stand Technik Soll 50%	Current Technology Status Ideal 50%
	30% bei Grund 50%	30% with Basic Layout 50%
	Stand Technik Soll 30%	Current Technology Status Ideal 30%
8	Verschnittanteil	Dilution Portion
9	Bei 30% Grundauslegung	With 30% Basic Layout
10	Real Grund 30%	Real Basic 30%
	Ideal 30%	Ideal 30%
	Stand Technik Soll 30%	Current Technology Status Ideal 30%
	50% bei Grund 30%	50% with Basic Layout 30%
	Stand Technik Soll 30%	Current Technology Status Ideal 30%
11	Verschnitt bei 30% Grundauslegung	Dilution for 30% Basic Layout